REVIEWS

H. T. Huang, *Science and Civilisation in China.* Vol. VI, Part 5, *Fermentations and Food Science.* Cambridge: Cambridge University Press, 2001. xxviii, 741 pp., ills.

Ute Engelhardt

[Ute Engelhardt is lecturer at the Department of Asian Studies, University of Munich, vice-president of the International Association of Chinese Medicine (SMS) and editor-in-chief of the journal Chinesische Medizin*. She is co-author of* Chinesische Diätetik*, Urban & Schwarzenberg, München, 1997].*

This volume, the 21st to appear in Joseph Needham's series *Science and Civilisation in China*, represents the culmination of a lifetime's work of the author H. T. Huang (Huang Hsing-tsung). It is the result of more than fifty years of observations and research into the history, technology and practice of processing food products in China. H. T. Huang is both a distinguished biochemist and deeply learned in Chinese tradition. In the early 1940s he served as Joseph Needham's secretary in Chongqing and later went on to obtain a degree in chemistry at Oxford. After that, he worked for food processing and pharmaceutical companies in the United States. He also served as a program director for the National Science Foundation and more recently was Deputy Director of the Needham Research Institute. In his "author's note" he explains vividly his lifelong interest in food processing practices, which began in a Chinese village in the 1940s.

This book is an amply documented study of ancient Chinese food resources, culinary methods, literary sources on food and drink, various kinds of fermentation, including alcohol, soybeans and pickles, food preservation, the production of oils, malt sugar and starch, the processing of wheat flour, and tea processing and its effects on health. It also considers briefly a number of related issues, including Chinese approaches to nutritional deficiency diseases. The author traces the origin and development of Chinese food products, explains the scientific basis of traditional Chinese processing technologies, and whenever possible, compares them with similar processes in European and other cultures in the world.

The eight subsections of this volume provide 1) an introduction to food resources in ancient China and the Chinese culinary system; 2) a review of primary and secondary sources; 3) an analysis of fermentation processes and the evolution of alcoholic drinks; 4) a study of soybean processing and fermentation; 5) a discussion of food processing and preservation techniques; 6) a succinct history of

tea processing and utilisation; 7) a short review of food and nutritional deficiency diseases; 8) an epilogue with theoretical reflections and conclusions.

The author begins with an ample introduction to the various types of grains, oilseeds, vegetables, fruits, land and aquatic animals used in Chinese cooking (pp. 17-65). Moreover it deals with methods of cooking, utensils, seasonings, dining vessels, implements and furniture that played an important role in the history of Chinese cooking and eating (pp. 66-115). This is the most convenient and reliable presentation of this information in a Western language, although some of it is available elsewhere, especially in Chinese. The section on eating implements is especially informative. For example, Huang notes that in the Warring States period chopsticks were used only for eating viands, not grain food, which was eaten with the fingers (p. 104).

Another valuable section of the book (pp. 116-148) concerns the literature and sources that contribute to the study of Chinese culinary science. The author gives a detailed inventory of what information about "culinary content" can be obtained from such works as the *Shijing* 詩 經 (Book of Odes), *Chuci* 楚 辭 (Elegies of Chu State), *Liji* 禮 記 (Record of Rites), *Lüshi chunqiu* 呂 氏 春 秋 (Master Lü's Spring and Autumn Annals), and the Mawangdui 馬 王 堆 bamboo slip lists of food products. The author also surveys the vast Chinese repertoire of pre-modern works concerned with food and drink, including the so-called "food canons" (*shijing* 食 經), works on wine technology and "materia dietetica" (on the medicinal properties of foods). He concludes with a review of the most important modern secondary studies of food culture and technology.

The main part of this outstanding work is the long section devoted to fermentation (pp. 149-378). It begins with a lucid and comprehensive account of the origin and evolution of *jiu* 酒 (alcoholic drinks) in China. Other valuable information in this section is the discussion of ferments (*qu* 麴). They are often inaccurately translated as 'yeast', whereas Huang prefers the translation '*ferment*' (always italicized). These *ferments* are made by the controlled exposure of cooked grain to organisms naturally present in the environment. Modern analyses indicate that *ferments* contain a wide variety of moulds, yeasts and bacteria (pp. 280, 592). One also learns much about *hongqu* 紅 麴 (red yeast rice), which Huang translates as "red *ferment*". The Chinese used it for various purposes: as a food preservative and flavoring agent, to make wine, and medicinally to improve digestion and enhance circulation. In modern Western medicines it is now becoming more and more popular for lowering serum cholesterol.

Though it seems clear that the *ferments* were developed in the context of alcohol production, they have turned out to be useful in a wide variety of other food processes, especially in the preparation of soybean, vegetable, meat and fish preserves and sauces which are so important in Chinese cuisine. In this context, Huang devotes nearly a hundred pages (pp. 292-378) to a discussion of the various culinary uses of the soybean: soybean sprouts, bean curd, fermented soybeans (*doushi* 豆 豉), fermented soy paste (*jiang* 醬) and fermented soy sauce

(*jiangyou* 醬 油). Among all these highly interesting findings, the section on bean curd is one of the most valuable. Here, by means of an analysis of a mural painting discovered in a tomb located in Dahuting 打 虎 亭 county (Henan province), he provides evidence that the Chinese were making bean curd as early as the Han dynasty.

The next part deals with food processing and preservation techniques (pp. 379-502), where the author considers all manner of fermented condiments, as well as the techniques of drying and salting. He then goes on to the production of vegetable oils, malt sugar and starch. Moreover he devotes forty pages to the important subject of the processing of wheat flour to make what the Chinese called *mianshi* 麵 食 "flour food", including *bing* 餅, the most common type of flour food in the Han and early medieval period, as well as steamed buns and different sorts of noodles.

The final food item that the author discusses in detail is tea (pp. 503-570). This is certainly an unique account of the history, processing and utilisation of tea in a Western language. After surveying the impressive number of "tea books" (table 47 at p. 516), Huang describes the various methods for processing tea, cake teas, loose tea and different varieties of teas, such as oolong and black/red tea. Equally informative is his account of the methods of making tea. Finally, the author discusses the medicinal qualities of tea.

The final section of this book is a brief survey entitled "food and nutritional deficiency diseases" (pp. 571-591) Here Huang briefly outlines the concept of Chinese dietary therapy (*shiliao* 食 療), in which foods are used as therapeutic agents for the treatment of diseases, and then turns to Chinese treatments of goitre, beriberi and night blindness. He may have chosen the topic of nutritional deficieny diseases in order to continue the work of Lu and Needham, who submitted their paper "A Contribution to the History of Chinese Dietetics", dealing mainly with nutritional deficiency diseases, to *ISIS* more than fifty years ago (p. 578).

Huang's approach to the history, technology and practice of processing food products in China is rather similar to Needham's intent of the SCC series: to show that Europe was never the sole agent in forming modern science. At the beginning of his remarkable book, Huang argues from the perspective of biochemistry that the fermentation processes required for making products such as "rice wine, vinegar, soy paste, soy sauce and related fermented products" are "ancient prototypes of modern bio-technology" (p. 14). Huang's work is a thorough analysis of the archeological, classical, historical, medical, literary, scientific and secondary literature on food processing in China and the reader will find here all he needs for his research. For anthropological, sociological, cultural, literary or even post modern interpretations of food in Chinese culture, he must look elsewhere.

All in all, this large volume is a most welcome contribution to the study of Chinese food science and culinary history and it can be seen as the definitive work in any language on Chinese food science.